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June. 1959 Vol. 3, No. 6

AIR RESEARCH AND DEVELOPMENT COMMAND

A·R·D·C newsreview

JUNE, 1959

Bausch & Lomb Optical Company

. . . Optical experts for over a century

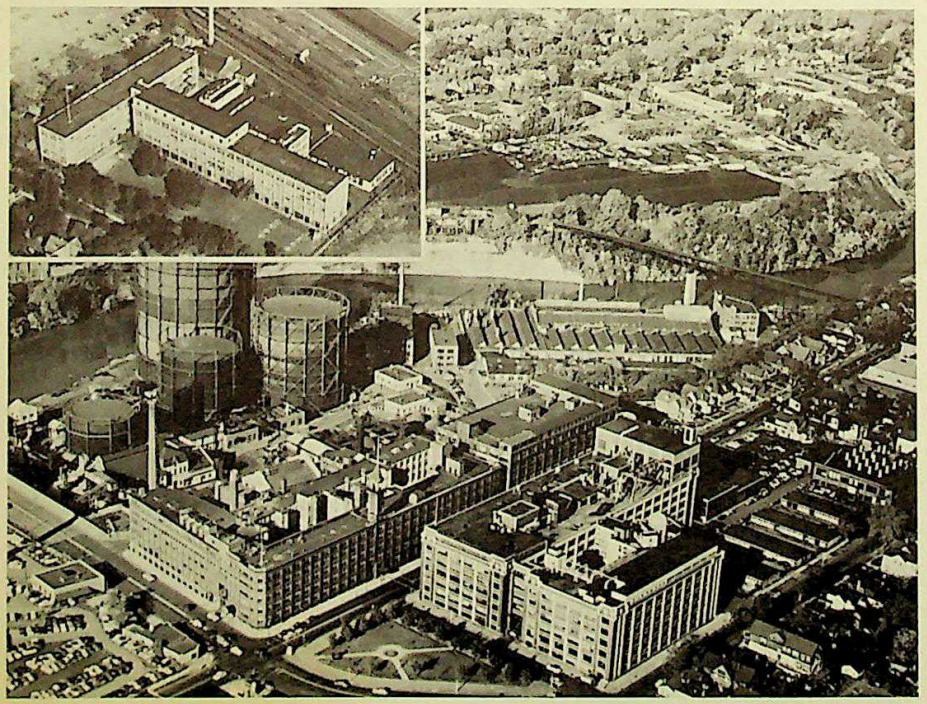
RESEARCH AND MANUFACTURING experts at Bausch & Lomb Optical Co., Rochester, N.Y., are playing important roles in one of the most interesting of the Air Research and Development Command's current developments in guided missile work—the area of infrared optics. R&D studies on infrared (*IR*) are being conducted for the Air Force in such specialized fields as target detection and tracking. In addition to intensive IR studies, Bausch & Lomb is in the fore in development of instruments for recording and interpreting aerial photos for military topography.

It isn't surprising that Bausch & Lomb is currently emphasizing technical research in these areas. Since the company was founded in 1853, constant experimentation has been carried on to develop the highest quality optical products and scientific instruments for both military and peacetime use. The company has contributed to national defense in every conflict since the Civil War.

During World War II, more than 80 percent of B&L research and manufacturing facilities were geared to turn out defense products, such as bomb sights, range finders, periscopes and telescopes, as well as special long-range binoculars for naval and air service. B&L was one of the few companies to receive five Army and Navy awards for outstanding defense production.

Much of the ability to turn out these defense goods rests with the fact that for years before the war, B&L had continuously developed new and better types of optical glass in its own glass plant. When the international conflict cut off the European supply of glass, the company was in a position to work independently. Today, Bausch & Lomb is the only optical company in the entire Western Hemisphere which, in the production of complex optical systems, starts with the composition and manufacture of the glass itself. Through its glass chemistry research and manufacturing facilities, B&L has produced hundreds of different types of glass.

The company has two main product lines: opthalmic goods and scientific instruments. These are handled by two corresponding sales groups, referred to as Ophthalmic and Scientific Instrument Divisions. As an integral part of the latter division, the Contract Department handles many military projects both as prime and subcontractor. Photogrammetric and aerial mapping projects conducted for ARDC are handled through a second department, known as The Photogrammetric and Nuclear Products Section.



The main plant of Bausch & Lomb Optical Co. is located in Rochester, N. Y. It contains the manufacturing center for ophthalmic and scientific instruments, research and development facilities, and executive offices of the company.

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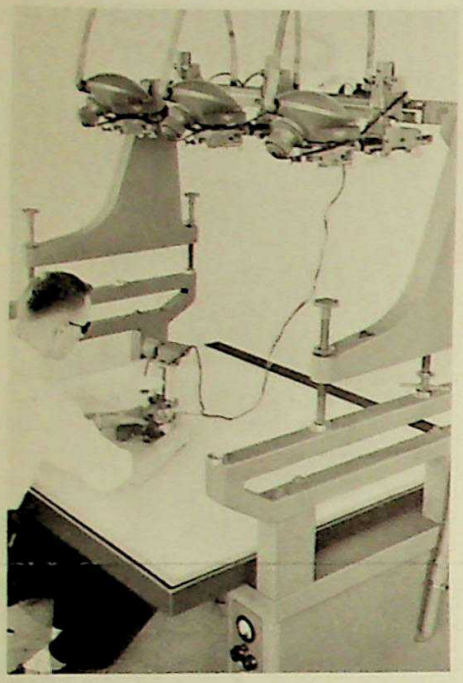


The new Balplex 760 aerial plotter is just one example of B&L photogrammetric mapping equipment. Instruments of this type have wide application by the Air Force for accurate processing and interpretation of maps made from aerial photographs.

Infrared Optics

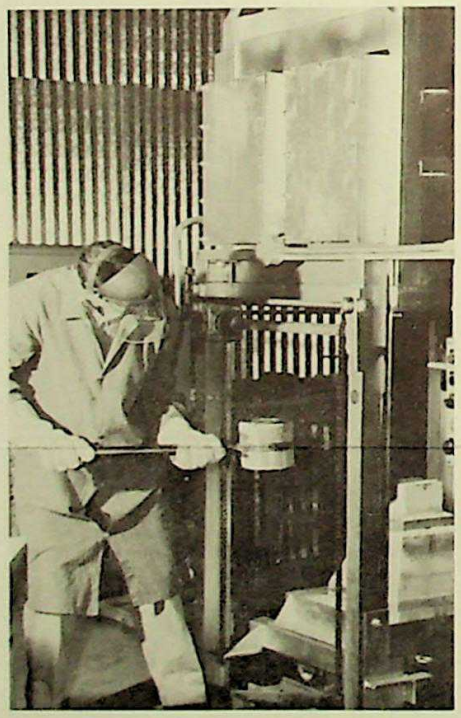
Within the Contract Department, current work with Air Research and Development Command units is mainly in the area of R&D studies in the field of infrared optics. These include weapon systems analysis, IR research and application, low-altitude, high-speed flight systems and electronic systems analysis. In all of these projects, the Contract Department works closely with the Chemical Research Lab and Defense Engineering Department.

At the present, R&D studies are being conducted on the complex infrared optics of the Falcon and other air-to-air guided missiles—specifically the lenses, mirrors, domes and windows through which the missiles search out their targets. A second major project was a portion of the optics for the AN-ASB-9 system of the B-52 bomber. This contract concerned the navigational-bombing system and included the optical and electronic components which form a part of the larger, complex system.

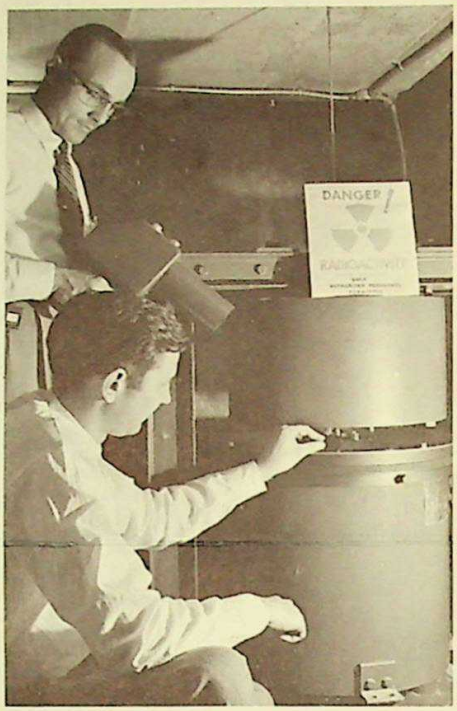
A special helmet mounted binocular has been developed under ARDC auspices for evaluation as an aid to pilots in guiding pilot-controlled missiles such as the Bullpup. Recently, R&D study was initiated on an anti-missile system under Project DAMS, which involved the use of optics as part of the infrared ranging equipment. Although these contracts refer specifically to the Air Force, B&L has similar contracts with other branches of the armed forces.

The infrared research and production facilities of Bausch & Lomb are of particular importance at a time when, for a variety of reasons, infrared is tending to displace radar and even newer electronic systems.

Among the advantages of infrared over radar as a detection system is the fact that IR is "passive" rather than "active." In detecting or seeking out an enemy target, it does not disclose its own location and identity. Infrared radiation cannot be jammed by techniques used against radar. There is no way to "cancel out" an object's infrared radiation. Consequently, the more active the object, the greater its IR radiation. In an era of high-speed jet aircraft and rocket-powered missiles, infrared has become one of the most accurate and reliable types of detection systems.



Melting process is one of the early stages in development of infrared optics. Here a melt is being removed from special apparatus which has been designed for IR glass. Components produced from this melt will be used for missiles and aircraft as well as other military applications.



Technicians in Bausch & Lomb Chemical Research Laboratory use a Cobalt 60 source to check gamma radiation's effect on optical materials. The program, jointly sponsored by B&L and AEC, will have application for military purposes, in medicine (cancer research), and in the food industry.

Compared to radar, infrared systems are less expensive and less complex to manufacture and they provide a better definition of the target. By its very nature, IR can discriminate more accurately than can radar.

The many and varied R&D projects for military purposes have also contributed to the leading position which the company maintains in the industrial application of infrared materials. Considerable information has been compiled on such specialized subjects as transmitting glasses and interference filters.

The rapid pace set by research and development in the field of infrared has prompted Bausch & Lomb to issue current research findings as periodic progress reports. These reports, which are essentially engineering bulletins, are finding extremely wide use as reference material by thousands of engineers and technical personnel in

both industrial and military organizations.

Photogrammetric Instruments

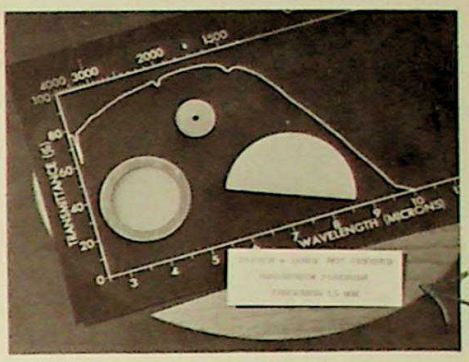
The Photogrammetric and Nuclear Products Section, part of the Scientific Instruments Division, is responsible for working with the government and prime contractors on the development of special instruments for the interpretation and processing of aerial photographs. Current R&D contracts in this area concern three major classes of military products: stereoscopes, photographic rectifiers and aerial plotters.

Stereoscopes are used for the direct viewing of aerial photos. This type of instrument provides the operator with a 3-dimensional view of the original photo which gives maximum detail and eliminates the need to project the photo onto a screen. These instruments are now being supplied under contract to a leading air development center. One of the specific applications of this instrument is its use for target detection. Research and Engineering is continuing to work with the Photogrammetric Section on the development of further variations of the stereoscope. These will include wider and higher ranges of power, and expanded film applications.

Bausch & Lomb photographic rectifiers are being manufactured and supplied to the Air Force and other military branches. These instruments are used at aerial charting centers for the processing of photos taken originally from a tilted camera position and which must be rectified to a vertical position.

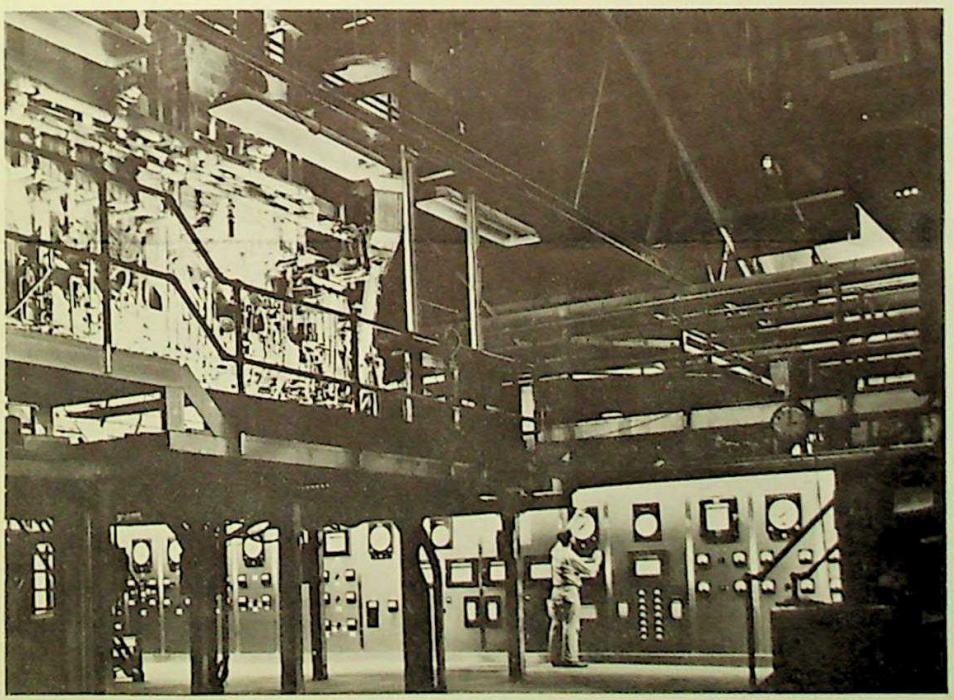
Further research is underway on the design and manufacture of precision rectifiers. For example, two types of high-tilt rectifiers are being produced for "high tilt" problems. One of the applications of this type of instrument is when the reconnaissance plane does not fly directly over the area to be photographed and the camera must take pictures from a considerable distance and at a greater than normal angle of tilt. Specially designed optical systems are incorporated which give photographic enlargement as well as solve long focal length and high tilt problems.

In the third category, plotters are used as accurate aerial measuring instruments. B&L has already undertaken considerable production work in this area, supplying the instrument to the various military air services. Preliminary work is being conducted to develop instrumentation for highly accurate measurement of distances on the aerial photo itself.



Special window and lense materials, produced by a new process under Air Force sponsorship, combine high and stable infrared transmission with excellent physical properties.

The B&L Roll Film Stereoscope is used for the direct viewing of aerial photos and provides the operator with three-dimensional view and maximum detail.



This giant control panel in the glass plant regulates temperature changes and other steps in the manufacture of optical glass. At the left is part of one of four giant continuous flow furnaces used in converting raw materials into high quality glass.

Other Developments

Additional sections of the B&L Scientific Instruments Division are engaged in other phases of research and development for the government as a sub-contractor. Currently the Analytical Instruments Section, for example, is supplying optical components which are used as an integral part of the missile tracking equipment.

The company is well known as the supplier of special concave gratings which are components in the cameras recently used to photograph the sun. This is only one of the ways in which Bausch & Lomb cooperated on special projects connected with the International Geophysical Year Program.

The extensive experience which Bausch & Lomb has had in the devel-

opment of optical systems, and the years of research on such contemporary materials as infrared filters and aerial photographic lenses, provide the company with excellent R&D facilities for the solution of the optical problems which will continue to arise in the expanding aircraft and missile programs.

Bausch & Lomb Optical Company . . .

Optical experts for over a century

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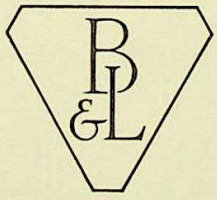

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